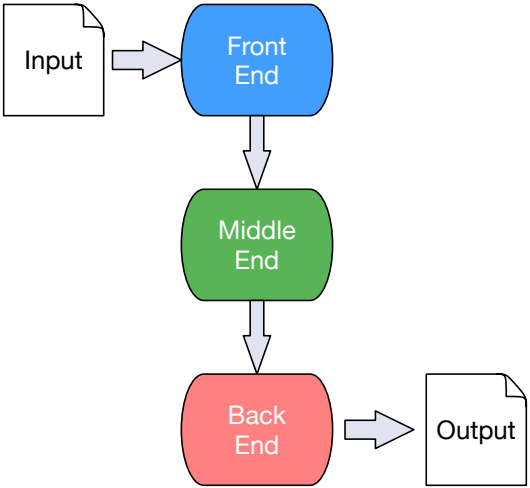
Compiler Construction

Middle End

General layout – Compiler structure



Goal of middle end

- Generic optimisations
- Prepare and simplify backend !
  - No nested sequences in ASM
  - No expressions in ASM
  - No two-way conditional jumps in ASM
  - ASM has calling convention

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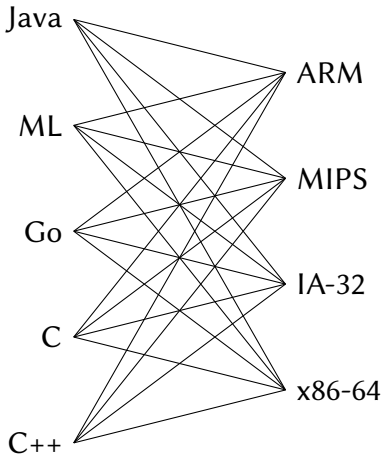
Do we require an intermediate representation?

Retargetable Compilers (1/2)



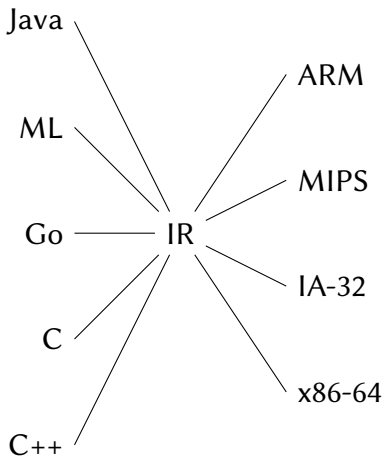
Goal of middle end

An intermediate representation is not required

BUT

.. preferable for optimisations and retargetable compilers

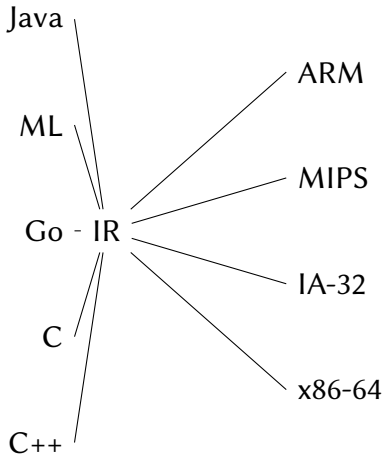
Retargetable Compilers (2/2)



What abstraction?

What is the best abstraction level for the intermediate representation?

Strategy 1: close to front end



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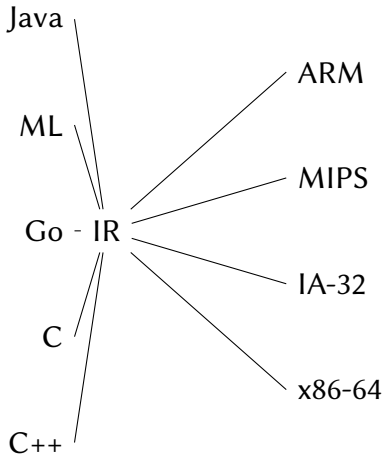
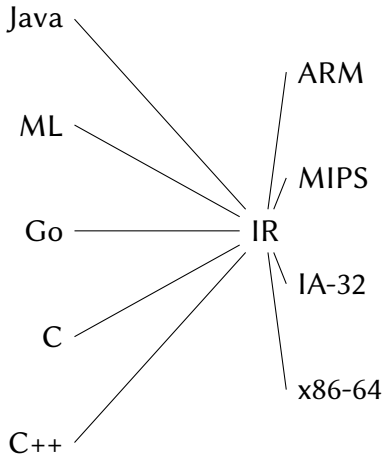
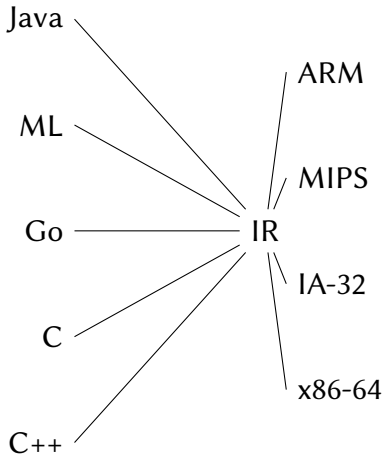


- Easy translation from source language
- Very hard translation from IR to ASM

Strategy 2: close to back end



Strategy 2: close to back end



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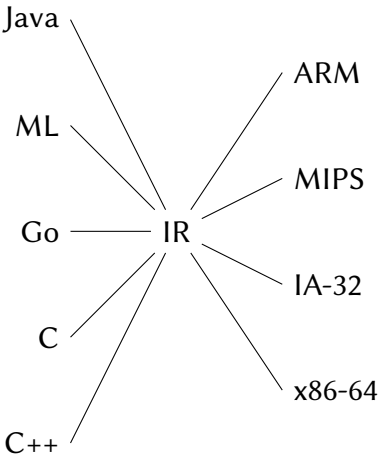
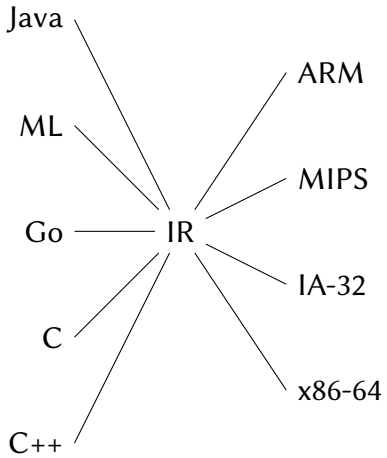
Strategy 3: barycenter of sources and targets

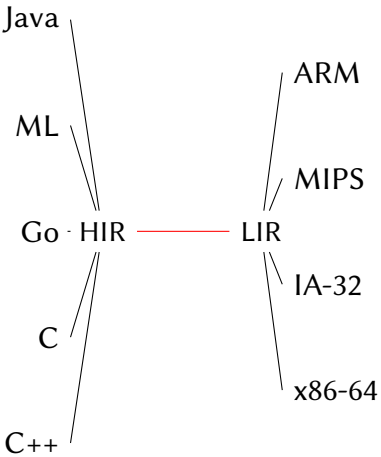


Strategy 3: barycenter of sources and targets

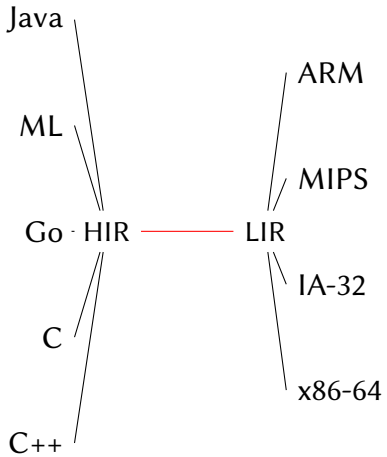


- Hard to find the barycenter of languages
- Not so easy translation from source to IR and from IR to ASM

Strategy 4: Two IRs

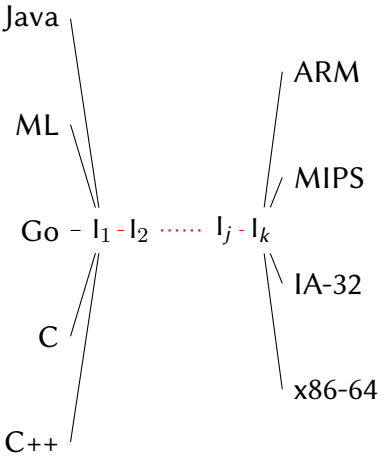


Strategy 4: Two IRs

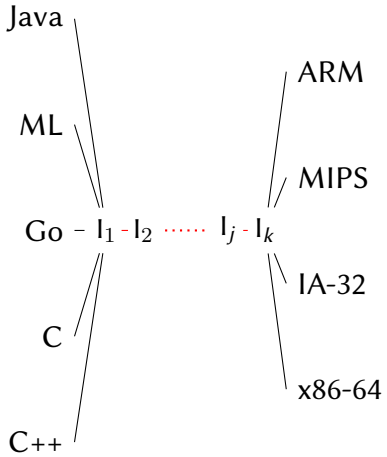


- Easy translation from source to HIR and from LIR to ASM
- Hard translation from HIR to LIR

Strategy 5: Many IRs



Strategy 5: Many IRs



- Easy translation from source to I_1 and from I_k to ASM
- Hard to define multiple language

Solution

l_1, l_2, ..., l_j, l_k are the same language!

l_j is sugar over l_k
...
l_2 is sugar over l_3
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$\Rightarrow$ Translation from HIR to LIR will only a **form** of unsugarring

Summary